

INTRODUCTION

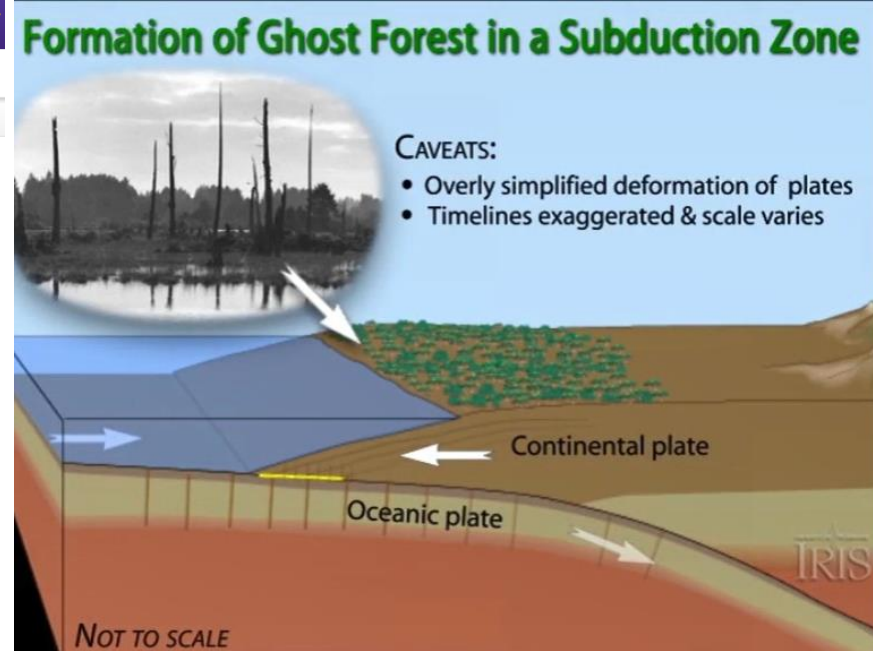
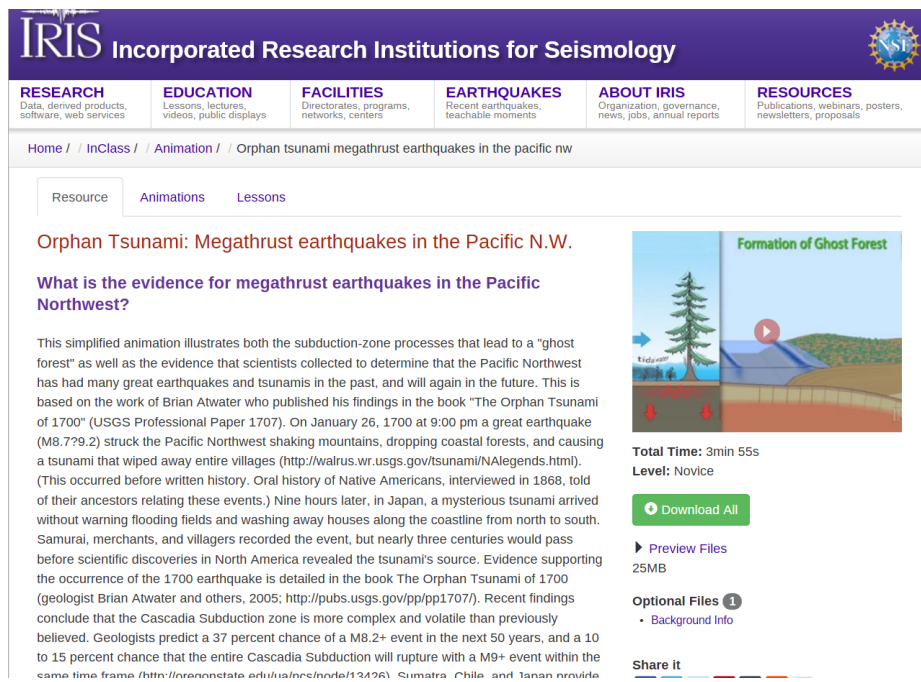
In January of 1700 a tsunami hit Japan. Nobody knew it was coming, as no earthquake had occurred. This is known as Japan's "Orphan Tsunami". Where did it originate? Native people in the Pacific Northwest have stories of an ancient earthquake and tsunami that swept away villages and uprooted trees in the middle of the night. Brian Atwater and other scientists dug trenches inland in the saltmarshes and looked for evidence of tsunamis deposits. They found a layer of beach sand over ancient topsoil and charcoal, covered by saltmarsh deposits. The beach sands were carried inland by the tsunami waves, and deposited upon the saltmarshes. Charcoal from natives' campfires below the beach sands allows for radiocarbon dating. The presence of a ghost forest, or drowned trees, is further evidence of a large tsunami inundating inland in the late 1600's to early 1700's. The last tree growth ring in these trees occurred in 1699. Atwater and his colleagues have tied the Orphan Tsunami that hit Japan in 1700 to a large earthquake (8.7 to 9.2 perhaps) and tsunami in the Cascadia Subduction Zone in January of 1700.

Tsunami Wave Tank Methods

In the spring of 2017, the Morehead Planetarium and Science Center held a Science Expo at UNCP during Parents' Weekend. We had demonstration booths set up outside of the UC. My demonstration was a tsunami wave tank that I built. This consisted of an aquarium tank, play sand in the bottom at a sloping angle, a set of granite slabs glued together that are attached to a set of chains. The tank is filled to some extent with water, enough to create an ocean while leaving a sloping beach. Small buildings and trees were utilized to create scale. To create the tsunami I simply pull up on the chains quickly, offsetting the water column. The water will recede from the shoreline briefly before inundating the coast.

Stratigraphy Activity Methods

This activity was presented as part of the Science Expo and Symposium conducted by the Morehead Planetarium and Science Center's Impactors program. We conducted mini lessons with visiting middle school students at UNCP in Spring of 2017. Stratigraphy cups were created by layering different colored Jello in layers within an opaque cup. Each layer represented a different stratigraphic layer in the subsurface. Sea shell pasta represented fossil marine shells. Cupcake sprinkles represented beach sand carried to inland marshes by ancient tsunamis. Green glitter represented Glauconite, a mineral present in some marine sand and muds than can yield a radiometric date for deposition. Students watched the narrated (by me) video lesson (IRIS) on Japan's Orphan Tsunami in 1700, and then took core samples from their cups. Inserting a straw and twisting it, then covering the end with their thumbs yielded a relatively intact core sample (cooking spray on the bottom). Spoons were on hand to allow for trench digging.



Sarah rains educator
Pinterest



Stratigraphic layers ready for core sample withdrawal...now imagine an opaque cup.

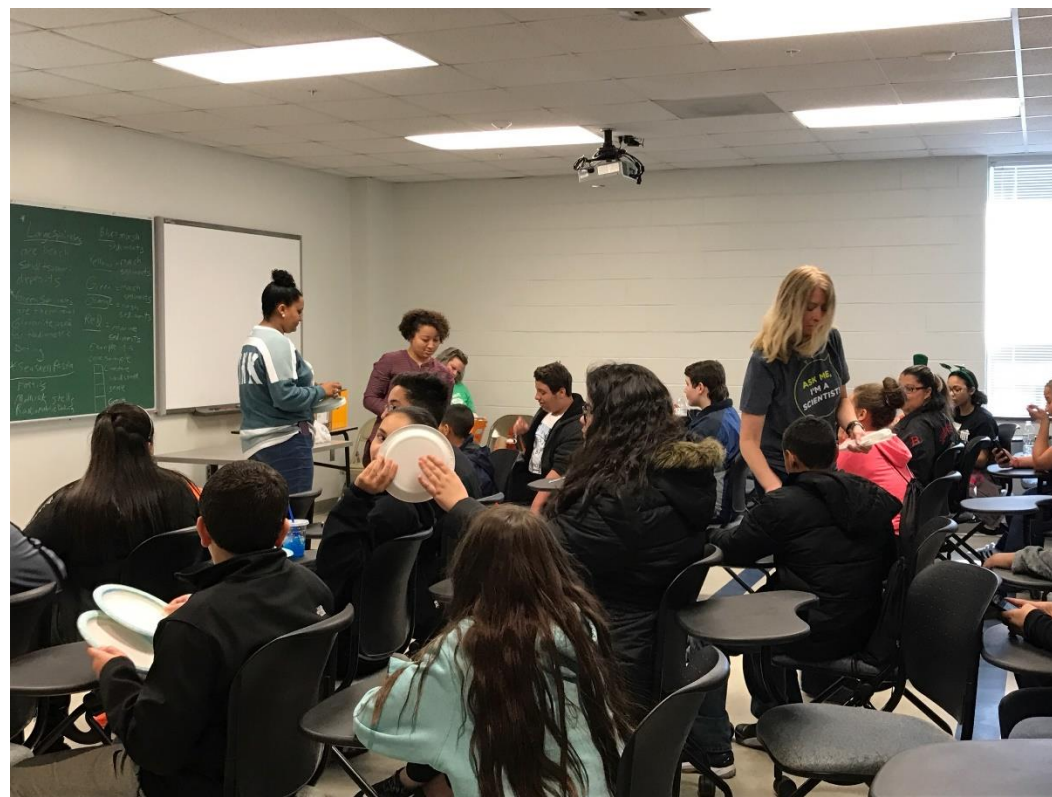
Tsunami Wave Tank Demonstration



Before demonstrating the tsunami, I ask the kids to hypothesize what will happen to the water at the shoreline when the offset first occurs, before the tsunami wave arrives. Some of the kids correctly said the water would recede first, before inundating the beach. Some kids just wanted to stick their hands in the tank and rearrange the sand. Color flyers depicting tsunami damage was on the table as well.



Science Symposium UNCP



Evidence for earthquake & tsunami

Native Americans: Ancestral stories of earthquake & tsunami
Plant and Native American artefacts in rich topsoil



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IRIS Incorporated research Institutions for Seismology, Orphan Tsunami: Megathrust earthquakes in the Pacific NW

Atwater, Brian, The Orphan Tsunami of 1700, USGS Professional Paper 1707.